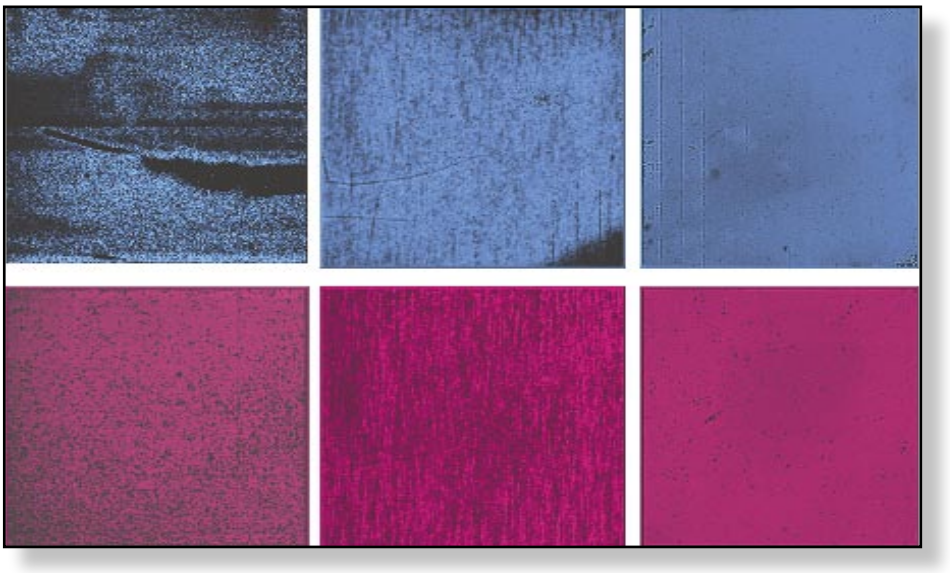
# Air Force Research Laboratory|AFRL

***Science and Technology for Tomorrow's Air and Space Force***

## *Success Story*

## IMPROVEMENTS IN DUALBAND LWIR FPAS



AFRL manages a Rockwell Scientific Company effort known as the Advanced Long-Wave Infrared Two-Color Focal Plane Array (ALIRT FPA) program, which researches dualband, mercury (Hg) cadmium (Cd) telluride (Te) wafers grown with molecular beam epitaxy. Dualband FPAs provide greater discrimination capability and reduce the false alarm rate associated with viewing scenes of various target types. They image targets simultaneously in two infrared bandpasses, and these images are perfectly registered on a pixel-by-pixel basis. Targets, decoys, and background clutter have time-varying signals, with variation due to intrinsic target fluctuations altering target range.

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## Accomplishment

During the study, scientists overcame several performance issues that had previously limited dualband capability. Paradoxically, the HgCdTe's longer wavelength response represented the greatest challenge, since the narrower energy band gap renders the material more sensitive to its crystalline imperfections. However, as a result of large Department of Defense investments in long-wave infrared (LWIR) HgCdTe for the Space Tracking and Surveillance System, the longer wave band (Band 2) initially outperformed the shorter wave band (Band 1) in terms of improved dark current and diode current-voltage characteristics.

ALIRT Band 1 performance was initially compromised by the deep etching of the material required at each pixel site to establish electrical contact with that pixel's Band 1 diode, as well as the Band 1-to-Band 2 transition architecture. The combined efforts of the ALIRT program and the Army Night Vision and Electronic Sensors Directorate program for dualband flexible manufacturing—with its emphasis on midwave and long-wave dualband capability—solved the Band 1 problem.

## Background

ALIRT FPAs comprise both the detector array and a cryogenic detector multiplexer fabricated in a commercial silicon foundry. Both the detector array and the multiplexer are based on a specific dualband design. The HgCdTe detector material is grown with molecular beam epitaxy, providing precise control of compositional (relative amounts of Hg and Cd) and doping profiles. The approach is ideal for dualband pixel architectures, where separate signal photocurrents must be generated and output from separated vertical layers in each pixel.

Space Vehicles
Emerging Technologies

## Additional Information

To receive more information about this or other activities in the Air Force Research Laboratory, contact TECH CONNECT, AFRL/XPTC, (800) 203-6451 and you will be directed to the appropriate laboratory expert. (05-VS-02)